

Appl. No. 09/738,807  
Arndt. dated 07/29/2005  
Reply to Office Action of 04/05/2005

**The Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1.-46. (cancelled)

47. (new):

A method for secure in-band management of a network device that provides routing and forwarding services, the method comprising:

configuring a virtual private network (VPN) for the network device;

linking the VPN to a source of management commands;

using the VPN to carry management traffic from the source of management commands to the network device; and

using the network device to forward management traffic to a management port of the network device through a VPN module.

48. (new):

The method of claim 47 wherein the network device includes a routing and forwarding module and a management VPN module coupled to the routing and forwarding module.

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49. (new):

The method of claim 47 wherein the network device is one of a network switch, a network bridge, a network hub, and a network gateway.

50. (new):

The method of claim 47 wherein the network device can perform one of Internet Protocol (IP) services, Multiprotocol Label Switching (MPLS) services, and Asynchronous Transfer Mode (ATM) services.

51. (new):

The method of claim 47 wherein the source of management commands is one of a management device and a management function.

52. (new):

A network device that provides routing and forwarding services for a data network, the network device comprising:

a routing and forwarding module to forward data received from the data network on an input data link to an output data link in accordance with source and destination information contained in the data;

a router configuration module to perform management operations for the network device;

a management port coupled to the router configuration module to receive management commands for the router configuration module;

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a management VPN module coupled to the routing and forwarding module and to the management port, the management VPN module to provide management commands to the management port from a virtual private network (VPN) that uses a tunneling protocol on the data network to deliver the management commands to the routing and forwarding module.

53. (new):

The network device of claim 52 wherein the network device is one of a network switch, a network bridge, a network hub, and a network gateway.

54. (new):

The network device of claim 52 wherein the network device can perform one of Internet Protocol (IP) services, Multiprotocol Label Switching (MPLS) services, and Asynchronous Transfer Mode (ATM) services.

55. (new):

The network device of claim 52 wherein the source of management commands is one of a management device and a management function.

56. (new):

A network device that provides routing and forwarding services, the network device comprising:

means for configuring a virtual private network (VPN) for the network device;

means for linking the VPN to a source of management commands;

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means for using the VPN to carry management traffic from the source of management commands to the network device; and  
means for using the network device to forward management traffic to a management port of the network device through a VPN module.

57. (new):

The network device of claim 56 wherein the means for using the network device to forward management traffic to a management port of the network device through a VPN module includes a routing and forwarding module and a management VPN module coupled to the routing and forwarding module.

58. (new):

The network device of claim 56 wherein the network device is one of a network switch, a network bridge, a network hub, and a network gateway.

59. (new):

The network device of claim 56 wherein the network device can perform one of Internet Protocol (IP) services, Multiprotocol Label Switching (MPLS) services, and Asynchronous Transfer Mode (ATM) services.

60. (new):

The network device of claim 56 wherein the source of management commands is one of a management device and a management function.

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61. (new):

A machine-readable medium providing instructions, which if executed by a processor, cause the processor to perform an operation comprising:

configuring a virtual private network (VPN) for a network device;

linking the VPN to a source of management commands;

using the VPN to carry management traffic from the source of management commands to the network device; and

using the network device to forward management traffic to a management port of the network device through a VPN module.

62. (new):

The machine-readable medium of claim 61 wherein the network device includes a routing and forwarding module and a management VPN module coupled to the routing and forwarding module.

63. (new):

The machine-readable medium of claim 61 wherein the network device is one of a network switch, a network bridge, a network hub, and a network gateway.

64. (new):

The machine-readable medium of claim 61, further providing instructions, which if executed by the processor, further cause the processor to perform an operation comprising one of

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performing Internet Protocol (IP) services, performing Multiprotocol Label Switching (MPLS) services, and performing Asynchronous Transfer Mode (ATM) services.

65. (new):

The machine-readable medium of claim 61 wherein the source of management commands is one of a management device and a management function.

66. (new):

A data network comprising:

a plurality of network devices that provide routing and forwarding services for the data network;

a source of management commands transmitted to the plurality of network devices using a virtual private network (VPN) that uses a tunneling protocol on the data network;

wherein each of the plurality of network devices includes

a routing and forwarding module to forward data received from the data network on an input data link to an output data link in accordance with source and destination information contained in the data;

a router configuration module to perform management operations for the network device;

a management port coupled to the router configuration module to receive management commands for the router configuration module;

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a management VPN module coupled to the routing and forwarding module and to the management port, the management VPN module to provide management commands to the management port from the source of management commands.

67. (new):

The data network of claim 66 wherein each of the plurality of network devices is one of a network switch, a network bridge, a network hub, and a network gateway.

68. (new):

The data network of claim 66 wherein the plurality of network devices can perform one of Internet Protocol (IP) services, Multiprotocol Label Switching (MPLS) services, and Asynchronous Transfer Mode (ATM) services.

69. (new):

The data network of claim 66 wherein the source of management commands is one of a management device and a management function.